



NATIONAL RADIO ASTRONOMY OBSERVATORY

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25 April 2012

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)

Amendment of Part 15 of the Commission's) ET Docket No. 10-23
Rules To Establish Regulations for Tank)
Level Probing Radars in the Frequency Band)
77-81 GHz)

and)

Amendment of Part 15 of the Commission's)
Rules To Establish Regulations for Level)
Probing Radars and Tank Level Probing)
Radars in the Frequency Bands)
5.925-7.250 GHz, 24.05-29.00 GHz and)
75-85 GHz)

**Comments of the
National Radio Astronomy Observatory
Charlottesville, VA 22903**

Introduction

1. Here, the National Radio Astronomy Observatory ("NRAO" or "the Observatory") provides its comments responding to the Commission's Further Notice of Proposed Rule Making and Order FCC 12-34 ("the FN&O") regarding the Commission's proposals for rules governing operation of Level Probing Radars (LPR) including Tank Level Probing Radars (TLPR) inside containers or vessels.
2. NRAO (<http://www.nrao.edu>), operated by Associated Universities, Inc. (AUI), (<http://www.aui.edu>) under a cooperative agreement with the National Science Foundation, is the largest observatory dedicated to radio astronomy and one of the largest astronomical observatories in the world. NRAO operates one dozen radio astronomy stations in rural and remote regions of the United States that stand to be

affected to varying degrees by the proposed rules. University radio observatories not affiliated with NRAO also operate in these bands as noted below.

3. With respect to the specific bands mentioned for operation of LPR, radio astronomy has primary spectrum allocations over the entirety of the region 76-85 GHz, except at 77.5-78 GHz where it is secondary. Radio astronomy has no allocations in the lower-frequency bands of concern here but in the frequency band 6650 – 6675.2 MHz Footnote US 342 states that “all practicable steps shall be taken to protect the radio astronomy service from harmful interference.”

Overview

4. Following procedures recently adopted in Europe¹, the FN&O proposes to control the radiation escaping from the immediate vicinity of LPR by limiting the boresight eirp and beamsize of the radar. The maximum mean allowed boresight eirp increases from -33 to -14 to -3 dBm/MHz from the lowest to the highest band and the broadest allowed beamwidth narrows from 12° below 75 GHz to 8° above. In this way the mean escaping eirp, averaged over the half-sphere below the LPR, is limited to -41.3 dBm/MHz above 24 GHz, corresponding to the usual Part 15.209 limits, or -55 dBm/MHz below.
5. At 29 and 30 the FN&O solicits comments on the proposed beamwidth and sidelobe limits for LPR. Given that the boresight eirp of the radar is allowed to increase with frequency, a decrease in beamsize is needed to maintain the escaping eirp below allowed limits. However, the shape of the beam is also important because merely pointing the beam downward does not preclude radiation from escaping to the side. NRAO therefore supports the -10 dBi maximum sidelobe gain that is proposed.
6. NRAO notes that Footnote 10 of the FN&O states: “A radar operating at 5 GHz with a 4-inch antenna would illuminate an area with a diameter of 14.4 feet (6.1 meters) in a storage tank 20 feet high, whereas the same radar operating at 24 GHz would illuminate an area with a diameter of only 3.6 feet (1.2 meters)...”

Given that this text has appeared previously in the record, including in the *Notice and Order* where it is footnote 7, NRAO feels obliged to bring to the Commission’s attention several mistakes in the footnote text: 14.4 ft is 4.4 m, not 6.1 m as stated and 3.6 feet is 1.1 m. Further, the beam of the hypothetical antenna would not scale by a factor $14.4 \text{ feet} / 3.6 \text{ feet} = 4.0$ between 5 GHz and 24 GHz but rather by a factor $24 \text{ GHz} / 5 \text{ GHz} = 4.8$.

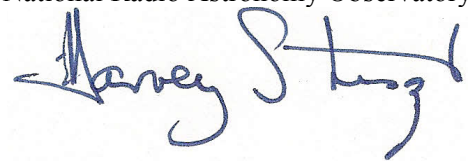
Finally, the hypothetical 4-inch radar operating at 5 GHz (outside the bands proposed for LPR) has a stated beamwidth of $14.4 \text{ ft} / 20 \text{ ft} = 0.72 \text{ radians} = 41.3^\circ$, much exceeding the 12° specification that is proposed in the FN&O for operations in the lowest band.

¹ www.ero.docdb.dk/docs/doc98/official/pdf/ECCDec1102.pdf

Considerations relevant to protection of the radio astronomy service from harmful interference

7. The FN&O references ECC Report 139 and the ETSI Technical Standard that informed the proposed FCC rules, but fails to note that Report 139 describes additional safeguards for radio astronomy that were included when the ECC adopted its rules for operation of LPR¹. Specifically, Appendix 2 of the ECC Decision of March 2011 provides for an exclusion radius of 4 km around radio astronomy stations operating at 6.6 GHz or in the 24 GHz or 75 GHz bands, except when individual exceptions are granted. It further limits to 15 m the height at which LPR may be installed within 40 km of such stations. As detailed in ECC Report 139, the exclusion zones adopted by the ECC have the minimum size needed to protect radio astronomy spectral line observations from harmful interference at the levels described in ITU-R Recommendation RA. 769 (Table 2 there), given the eirp limits on radiation escaping from the vicinity of the LPR: those eirp limits are the same as in the FN&O.
8. NRAO requests that the Commission adopt the same exclusion zones and height restrictions for LPR. The radio astronomy stations needing protection are those listed (albeit for other reasons) in Footnotes US 385 (below 75 GHz) and US 388. While no further stations are presently planned, it is important to note, given radio astronomy's primary status in the 76-85 GHz band, that more might be added in the future.
9. Given the language of US 342 regarding the band 6650-6675.2 MHz (see 3 above), NRAO asks that LPR operation in the band be excluded within line of sight to radio astronomy stations. Such a provision would be especially important if the exclusion zones and height restrictions needed to protect radio astronomy operations more generally are not adopted. Radio astronomy stations operating in the 6650 MHz band are those listed for other reasons in US Footnote US385.
10. NRAO requests that the FCC implement an installed equipment database like that which operated during the original TLPR waiver period, see the *Notice and Order* at 38. This could contain the location, height above ground, center frequency and bandwidth of LPR operation along with 24-hour/day contact information for the operator. Unlike the database that operated during the waiver period for TLPR this information should be publicly available, given that normal operations will have commenced.

Respectfully submitted,
National Radio Astronomy Observatory



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